

23. (Newly Added) The method as claimed in Claim 10, wherein the step of removing fluid from the fibre reinforced plastics further comprises removing gaseous fluid from the fibre reinforced plastics.

24. (Newly Added) The method as claimed in Claim 19, wherein the step of removing fluid from the hull further comprises removing gaseous fluid from the hull.

REMARKS

Applicant has amended the specification of the application to correct typographical errors referred to in the Office Action. Additionally, Applicant has amended claims 1-13 and 16 and has cancelled claims 14, 15, and 17, without prejudice. Finally, Applicant has added new claims 19-24. In light of the amendments to the claims, the rejections of the claims as being indefinite under §112 are now moot. Furthermore, Applicant respectfully submits that all pending claims 1-13, 16, and 19-20 are allowable over the prior art and submits the following arguments in support thereof.

The objective of the present invention is entirely different from that of the prior art. The prior art discloses the use of a vacuum to pull a flexible diaphragm against a surface in a manner to squeeze parts together. Generally, the cited prior art is concerned with inserting a patch into a surface to repair some physical damage to a surface, that damage being generally in the form of a hole through the surface. Unlike the prior art, the purpose of the present invention is quite different. The invention is not concerned with applying a patch or repairing physical damage. The purpose of the invention is to treat chemical damage, by extracting moisture and/or unreacted chemical compounds of a chemically damaged product through one of its surfaces. Preferably, the extracted compounds are first evaporated under the prevailing hard vacuum and high temperature and are then extracted in gaseous form.

As amended, claim 1 requires, among other things, the steps of "positioning a layer of gas permeable material in engagement with the portion of the surface of the product" and "removing fluid from the product by creating a partial vacuum by reducing pressure within the space in a manner such that the partial vacuum is in communication with all of the portion of the surface of the product that is in engagement with the layer of gas permeable material." French Pat. No. 2,693,147 issued to Leobon, (hereinafter the Leobon reference) discloses the use of both heat and vacuum pressure to cure a patch. However, no "gas permeable layer" as required by claim 1 is disclosed or suggested. Although the Leobon reference does refer to "a heated mat" (Derwent abstract translation), the French term being "tapis chauffant," it discloses such to

be formed from a flexible elastomer/silicone which is not permeable. Thus, the vacuum disclosed in the Leobon reference, i.e. to "[allow] one to de-pressurize the assembly and to ensure uniform sticking in the repair," is not disclosed or suggested as being in communication with all of the portion of the surface that is in engagement with a layer of gas permeable material. Hence, there is no disclosure in the Leobon reference which discloses the same inventive steps as the present invention as defined in claim 1, and no teaching in Leobon would lead to a solution to the problem which the invention solves.

U.S. Pat. No. 3,837,965 issued to Mahon (hereinafter the Mahon reference) discloses the use of a vacuum under a flexible membrane to draw the membrane (diaphragm) against a patch to make the patch conform to the curvature of a surrounding surface (column 3, lines 3 to 11). Once the vacuum has been applied to achieve this effect, most of the area under the membrane will be out of communication with the vacuum port, and there is no space necessary to maintain communication between the vacuum and the surface of the product being treated during the treatment. Thus, there is no disclosure in the Mahon reference which suggests the same inventive steps as the present invention as defined in claim 1.

U.S. Pat. No. 5,023,987 issued to Wuepper (hereinafter the Wuepper reference) pertains to the insertion of a patch in a hole in a structure and provides a mechanical arrangement for pulling the patch into place and holding it in place. The Wuepper reference does disclose a vacuum bag arrangement, but merely a vacuum bag arrangement as conventionally known in the composite material art. In particular, in the vacuum bag arrangement as shown in Figure 6, the layer in contact with the patch is a peel ply 142 is not disclosed as being permeable and is not disclosed as allowing the escape of gaseous compounds from the patch area covered by the peel ply. The bleeder and breather plies disclosed in the Wuepper reference are conventionally used to ensure that air is extracted from throughout the bag, so that no trapped air bubbles are left behind when the full vacuum is drawn. Thus, there is no disclosure of each of the steps of the present invention as defined by claim 1, and no teaching which would lead to a solution to the problem which the present invention overcomes.

U.S. Pat. No. 4,554,036 issued to Newsom (hereinafter the Newsom reference) discloses a device for bonding a patch into a structure via a membrane 10 positioned over and forced against a patch by a vacuum. A thermoblanket 30 is disclosed as being positioned between the membrane and the patch, but there is no disclosure of the thermoblanket being gas permeable. Furthermore, the text (column 5, lines 5 to 10) of the specification of the Newsom reference suggests that the "curing" takes place under atmospheric pressure. Thus, the

Newsom reference fails to disclose the invention as claimed and does not suggest an apparatus or method capable of solving the problem achieved by the present invention.

It is noticeable that all of the cited documents, without exception, come from the aerospace industry. The aerospace industry is generally regarded as high cost, high specification technology which is not obviously appropriate in relation to earthbound applications. Thus it is not obvious to look at aerospace industry techniques for use in less critical applications.

In light of the foregoing, the prior references, either alone or in combination, fail to disclose or suggest the method steps of "positioning a layer of gas permeable material in engagement with the portion of the surface of the product" and "removing fluid from the product by creating a partial vacuum by reducing pressure within the space in a manner such that the partial vacuum is in communication with all of the portion of the surface of the product that is in engagement with the layer of gas permeable material" as required by claim 1. For this reason, claim 1 is not anticipated by nor obvious in view of the prior art. It follows then that claims 2-9 and 22, being dependant upon claim 1, are also not anticipated by nor obvious in view of the prior art.

Similar to claim 1, independent claim 10 requires, among other things, the steps of "maintaining a space between the portion of the surface of the fibre reinforced plastics and the layer of impermeable material" and "removing fluid from the fibre reinforced plastics by creating a partial vacuum by reducing pressure within the space in a manner such that the partial vacuum is in communication with all of the portion of the surface of the fibre reinforced plastics." As discussed above, the prior art fails to disclose or suggests such method steps and therefore fails to anticipate or make obvious the invention as defined in claim 10. It follows then that claim 23, being dependant upon claim 10, is also not anticipated by nor obvious in view of the prior art.

Additionally, independent claim 11 requires, among other things, an assembly comprising "a layer of gas permeable material in engagement with the portion of the surface of the product in a space between the layer of impermeable material and the surface of the product" and "a partial vacuum within the space, the partial vacuum ... being in communication with the entire portion of the surface of the product that is in engagement with the layer of gas permeable material." As discussed above, the prior art fails to disclose or suggests such an assembly having such structural arrangements and therefore fails to anticipate or make obvious the invention as defined in claim 11. It follows then that claims 12, 13, and 16, being dependant upon claim 11, are also not anticipated by nor obvious in view of the prior art.

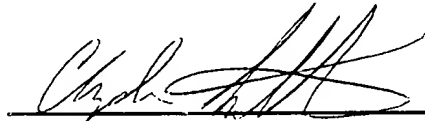
Newly added independent claim 19 pertains to a method of treating a glass fibre reinforced boat hull and include the step of "removing fluid from the hull by creating a partial vacuum by reducing pressure within the space occupied by the layer of gas permeable material." The prior art fails to disclose or suggest this step of a method to achieve the desired purpose, and as such, fails to anticipate or make obvious the invention as defined in claim 19. It follows then that claim 24, being dependant upon claim 19, is also not anticipated by nor obvious in view of the prior art.

Newly added independent claim 20 pertains to a kit having means for reducing pressure within a space in a manner such that fluid can be extracted from a boat hull through a portion of the surface of the hull and through a layer of gas permeable material engaged therewith. The prior art fails to disclose or suggest this a kit having such means and therefore fails to anticipate or make obvious the invention as defined in claim 20. It follows then that claim 21, being dependant upon claim 20, is also not anticipated by nor obvious in view of the prior art.

CONCLUSION

Applicant also acknowledges the references cited by the Examiner and in view of the amendments and remarks presented herein, it is respectfully submitted that the application is in condition for allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Clyde L. Smith", written over a horizontal line.

Clyde L. Smith
Reg. No. 46,292
Thompson Coburn LLP
One US Bank Plaza
St. Louis, MO 63101
314-552-6338

MARKED UP VERSION OF AMENDED CLAIMS

1. (Amended) A method of treating [a product which is made of a material which has or materials which have been applied to a surface in a liquid form and thereafter have dried or cured to make the product ready for use, wherein] a product having a surface, the surface of the product being of a material that was formed by a method of curing or drying a liquid after applying the liquid to the product, the method of treating the product comprising:
_____ [the edges of a sheet of impermeable sheet material are secured to a surface of the product to be treated to enclose a space between the surface and the sheet,] positioning a layer of impermeable material adjacent at least a portion of the surface of the product;
_____ positioning a layer of gas permeable material in engagement with the portion of the surface of the product in a space between the layer of impermeable material and the surface of the product;
_____ [heating is applied within the space,] applying heat within the space; and
_____ [and the gaseous contents of the space are continuously extracted while the sheet is held spaced from the surface to allow gas and vapour to be extracted from any area of the surface beneath the sheet] removing fluid from the product by creating a partial vacuum by reducing pressure within the space in a manner such that the partial vacuum is in communication with all of the portion of the surface of the product that is in engagement with the layer of gas permeable material.

2. (Amended) A method as claimed in Claim 1, wherein the [impermeable sheet material is secured to the surface by adhesive tape around the edges of the material, so that a space is provided between the impermeable sheet material and the surface] layer of impermeable material has a periphery and the step of positioning the layer of impermeable material further comprises securing the periphery of the layer of impermeable material to the surface of the product via adhesive tape.

3. (Twice Amended) A method as claimed in Claim 1, wherein the [impermeable sheet material has edges which are capable of forming an air tight seal when pulled against the surface by a vacuum]layer of impermeable material has a peripheral edge that is configured and adapted to form an air tight seal with the surface of the product when biased against the surface by the partial vacuum and the step of removing fluid from the product further comprises securing the peripheral edge of the layer of impermeable material to the surface via the partial vacuum.

4. (Twice Amended) A method as claimed in Claim 1, [wherein a vacuum pump is connected to the space to provide the extraction facility] further comprising operatively connecting a vacuum pump to the space between the layer of impermeable material and the surface of the product, the step of removing fluid from the product further comprising utilizing the vacuum pump to reduce the pressure within the space to create the partial vacuum.

5. (Twice Amended) A method as claimed in Claim 1, wherein [a vacuum is produced in the space before beginning to apply heat within the space] the creation of the partial vacuum in the step of removing fluid from the product commences before the step of applying heat within the space.

6. (Twice Amended) A method as claimed in Claim 1, wherein [a vacuum at a level of about 2 - 5 mb Abs is produced and maintained in the space] the step of removing fluid from the product further comprises reducing pressure within the space in a manner such that the partial vacuum is maintained between the levels of 2 mb Abs and 5 mb Abs for a period of at least an hour.

7. (Twice Amended) A method as claimed in Claim 1, wherein the product is a [glassfibre moulding made with a polyester resin and the surface within the space is heated to a temperature of between 80°C and 90°C] composite moulding of glassfibre and at least partially cured polyester resin and the step of applying heat within the space further comprises applying sufficient heat to cause the surface of the composite moulding to maintain a temperature between 80°C and 90°C for at least an hour, the method of treating the composite molding further comprising the step of preventing the surface of the composite moulding from reaching a temperature in excess of 90°C throughout the method.

8. (Twice Amended) A method as claimed in Claim 1, wherein the product is a [glassfibre moulding with an outer gelcoat and wherein the sheet material is secured to the surface after affected gelcoat, and any physically damaged material has been removed from the surface] composite moulding of glassfibre having an outer gelcoat and the method of treating the composite molding further comprises removing the gelcoat and any physically damaged material from the portion of the surface of the composite moulding prior to the steps of positioning the layer of gas permeable material in engagement with the portion of the surface of

the composite moulding and positioning the layer of impermeable material adjacent the portion of the surface of the composite moulding.

9. (Amended) A method as claimed in Claim 8, [wherein the treatment is completed by replacing removed gelcoat with fresh gelcoat] further comprising the steps of removing the layer of impermeable material and the layer of gas permeable material from the surface of the composite moulding and thereafter applying new gelcoat to the portion of the surface of the composite moulding.

10. (Amended) A method of treating fibre reinforced plastics of a boat hull [moulded from fibre reinforced plastics], the fibre reinforced plastics having a surface, [wherein the edges of a sheet of impermeable sheet material are secured to a surface of the hull to be treated to enclose a space between the surface and the sheet, heating is applied within the space, and the gaseous contents of the space are continuously extracted while the sheet is held spaced from the surface to allow gas and vapour to be extracted from any area of the surface beneath the sheet] the method of treating the fibre reinforced plastics comprising:

positioning a layer of impermeable material adjacent at least a portion of the surface of the fibre reinforced plastics;

maintaining a space between the portion of the surface of the fibre reinforced plastics and the layer of impermeable material;

applying heat within the space; and

removing fluid from the fibre reinforced plastics by creating a partial vacuum by reducing pressure within the space in a manner such that the partial vacuum is in communication with all of the portion of the surface of the fibre reinforced plastics.

11. (Amended) [Apparatus for treating a product made of a material which has or materials which have been applied to a surface in a liquid form and thereafter have dried or cured to make the product ready for use, the apparatus comprising an impermeable sheet, means for securing the sheet to a surface of the product to be treated to enclose a space between the surface and the sheet, means for holding the sheet spaced from the surface to allow gas and vapour to be extracted from any area of the surface beneath the sheet, heating means for applying heat within the space and means for continuously extracting the gaseous contents of the space.] An assembly comprising:

a product having a surface;

a layer of impermeable material positioned adjacent at least a portion of the surface of the product;

a layer of gas permeable material in engagement with the portion of the surface of the product in a space between the layer of impermeable material and the surface of the product;

a heater operatively connected to the space between the layer of impermeable material and the surface of the product; and

a partial vacuum within the space, the partial vacuum having a pressure that is less than standard ambient pressure, the partial vacuum being in communication with the entire portion of the surface of the product that is in engagement with the layer of gas permeable material.

12. (Amended) [Apparatus] The assembly as claimed in Claim 11, [wherein the means for extracting the gaseous contents of the space is a vacuum pump capable of working down to pressures of 5 to 2 mb Abs] further comprising a vacuum pump operatively connected to the space between the layer of impermeable material and the surface of the product, the vacuum pump being configured and adapted to maintain the pressure of the partial vacuum between the levels of 2 mb Abs and 5 mb Abs.

13. (Twice Amended) [Apparatus] The assembly as claimed in Claim 11, [wherein the heating means includes a thermostat and a controller so that a constant temperature can be maintained within the space] further comprising a thermostat operatively connected to the heater and to the space between the layer of impermeable material and the surface of the product, the thermostat being responsive to the temperature within the space and the heater being responsive to the thermostat.

14. (Cancelled, without prejudice)

15. (Cancelled, without prejudice)

16. (Twice Amended) [Apparatus] The assembly as claimed in Claim 11, wherein the [edges of the sheet are of a material which will form an air-tight seal against the surface when pulled against the surface by a vacuum] layer of impermeable material has a peripheral edge, the peripheral edge being secured to the surface of the product in an air-tight manner solely by a pressure differential resulting from the presence of the partial vacuum within the space.

17. (Canceled, without prejudice)

19. (Newly Added) A method of treating a glass fibre reinforced boat hull, the boat hull having an exterior surface, the method comprising:

positioning a layer of gas permeable material in engagement with a portion of the surface of the hull;

positioning a layer of impermeable material adjacent the layer of gas permeable material in a manner such that the layer of gas permeable material is positioned in a space between the layer of impermeable material and the portion of the surface of the hull;

securing the layer of impermeable material to the surface of the hull circumferentially around the space occupied by the layer of gas permeable material in a manner such that fluid can be evacuated from the space;

applying heat to within the space occupied by the layer of gas permeable material; and
removing fluid from the hull by creating a partial vacuum by reducing pressure within the space occupied by the layer of gas permeable material.

20. (Newly Added) A kit for treating a glass fibre reinforced boat hull having a surface, the kit comprising:

a layer of gas permeable material configured and adapted to be positioned in engagement with a portion of the surface of the hull, the layer of gas permeable material having a periphery;

a layer of impermeable material configured and adapted to be positioned adjacent the layer of gas permeable material in a manner such that the layer of gas permeable material can be positioned in a space between the layer of impermeable material and the portion of the surface of the hull, the layer of gas permeable material being configured and adapted such that the layer of impermeable material can not contact the portion of the surface of the hull when the layer of impermeable material is positioned over the layer of gas permeable material and the layer of gas permeable material is in engagement with the portion of the surface of the hull;

means for securing the layer of impermeable material to the surface of the hull around the periphery of the layer of gas permeable material to thereby enclose and seal the space between the layer of impermeable material and the surface of the hull when the layer of gas permeable material is positioned in the space between the layer of impermeable material and the portion of the surface of the hull;

means for applying heating within the space; and

means for reducing pressure within the space in a manner such that fluid can be extracted from the hull through the portion of the surface of the hull and through the layer of gas permeable material when the layer of gas permeable material is positioned in the space between the layer of impermeable material and the portion of the surface of the hull and the layer of impermeable material is secured to the surface of the hull around the periphery of the layer of gas permeable material.

21. (Newly Added) The kit as claimed in Claim 20, wherein the layer of gas permeable material and the layer of impermeable material are each sufficiently flexible so as to allow the portion of the surface of the hull to be one of a plurality of differently contoured portions of surfaces that are each compatible for use with the kit.

22. (Newly Added) The method as claimed in Claim 1, wherein the step of removing fluid from the product further comprises removing gaseous fluid from the product.

23. (Newly Added) The method as claimed in Claim 10, wherein the step of removing fluid from the fibre reinforced plastics further comprises removing gaseous fluid from the fibre reinforced plastics.

24. (Newly Added) The method as claimed in Claim 19, wherein the step of removing fluid from the hull further comprises removing gaseous fluid from the hull.

MARKED UP VERSION OF AMENDED PARAGRAPHS OF THE SPECIFICATION

(page 5, last paragraph, amended)

The means for extracting the gaseous contents of the space is preferably a vacuum pump capable of working down to pressures of [5 to 2] 2-5 mb Abs.

(page 10, fourth paragraph, amended)

The vacuum at which the system is effective depends upon the defects in the moulding. However the method is more efficient as the vacuum increases. Typical vacuum levels are close to 2.0 [Mb] mb absolute.